CLAIMS

1. A method of manufacture of a high density, integrated circuit module of the type including surface mount integrated circuit packages, comprising the steps of:

(a) providing a plurality of integrated circuit packages wherein each said package has a bottom surface and a top surface, and wherein a plurality of package leads extend from each said bottom surface;

(b) providing one or more lead carriers, wherein each said lead carrier is comprised of a plurality of electrically and thermally conductive elements, each of said conductive elements being formed having a lead connection portion adapted to receive one of said package leads, and an interconnect portion that provides an external-to-module point of electrical connection to one of said package leads;

(c) mounting one of said lead carriers to said bottom surface of one of said packages, wherein select ones of said mounted package leads are received by select ones of said lead connection portions; and

(d) mounting another one of said packages to said lead carrier of step c, forming a multiple package module.

2. The method of claim 1 for manufacture of an integrated circuit module, wherein each said conductive element of said lead carriers is formed having an aperture adapted to receive one of said leads.

3. The method of claim 1 for manufacture of an integrated circuit module, wherein each said package lead is comprised of solder and further comprising the step of:

(a) applying heat, wherein said solder becomes molten and each respective said package lead is electrically coupled to an associated said

conductive element that provides an external-to-module point of electrical connection to a package lead.

4. The method of claim 3 for manufacture of an integrated circuit module, further comprising the step of:

(a) repeating in order steps (c) and (d) of claim 1, and step (a) of claim 3 for each additional package provided in step (a) of claim 1, wherein the package of the previous step (d) becomes the package of step (c).

5. The method of claim 3 for manufacture of an integrated circuit module, further comprising prior to step (a) of claim 3, the step of:

(a) repeating in order steps (c) and (d) of claim 1 for each additional package provided in step (a) of claim 1, wherein the package of the previous step (d) becomes the package of step (c).

6. The method of claim 2 for manufacture of an integrated circuit module, further comprising prior to step (d) of claim 1 the step of:

(a) reducing the length of all said package leads by removing part of the distal end of each said package lead.

7. The method of claim 6 for manufacture of an integrated circuit module, wherein the method of reducing length of said package leads is by scything.

8. The method of claim 2 for manufacture of an integrated circuit module, wherein said apertures are formed with a channel adapted to fill with excess solder when said heat is applied.

9. The method of claim 2 for manufacture of an integrated circuit module, wherein each said aperture is formed to have a semi-circular shape.

10. The method of claim 1, wherein the methods of mounting include the use of adhesive.

11 The method of claim 10, wherein said adhesive is silicon adhesive tape.

12. The method of claim 10, wherein said adhesive is thermally conductive.

13. The method of claim 10, wherein said adhesive is B-staged adhesive.

14. The method of claim 1, wherein one of said lead carrier includes a substrate mounting portion, and further comprising the steps of:

(a) providing a substrate adapted to receive said substrate mounting portions; and

(b) mounting said stacked multiple package module to said substrate.

15. The method of claim 14, wherein said substrate has conductive pads, and wherein said substrate mounting portion has a plurality of solder coated leads adapted to electrically connect with said substrate conductive pads.

16. The method of claim 1, wherein said lead carrier is formed to have a plurality of thin layers of conductive material cut to form electrically isolated conductive elements, and wherein said plurality of thin layers of conductive material are separated by thin layers of dielectric material.

17. The method of claim 16, wherein the material, the thickness of said layers, the spacing between said conductive elements, and the geometry of said lead carriers are selected to obtain a desired impedance in select said conductive elements.

18. The method of claim 1, further comprising the steps of:

(a) mounting one or more external structures having one or more electrically and thermally conductive structure elements, wherein each said conductive structure element is adapted to be received by one of said interconnect portions; and

(b) electrically and thermally connecting select ones of said conductive structure elements to select ones of said interconnect portions.

19. The method of claim 1, wherein at least one of said interconnect portions is adapted to connect to said interconnect portion of an adjacent lead carrier, and further comprising the steps of:

(a) electrically coupling select said interconnect portions to select interconnect portions of said adjacent lead carriers.

20. The method of claim 1, wherein a first of said lead carriers is dissimilar to a second of said lead carriers, wherein one said interconnect portions of said first lead carrier and the corresponding interconnect portions of said second lead carrier do not electrically connect to corresponding said package leads.

21. The method of claim 1, further comprising prior to step c the step of:

(a) rendering electrically inactive a selected one of said interconnect portions by opening the electrical signal path in select one of said conductive elements.

22. The method of claim 1, wherein a select one of said interconnect portions of one of said lead carriers is removed.

23. The method of claim 20, wherein said lead carriers provide a unique address for each said package.

24 The method of claim 20, wherein said lead carriers provides a unique, data word bit position for each said package.

25 A method of manufacture of a high density, integrated circuit module, of the type including surface mount integrated circuit packages, comprising the steps of:

(a) providing a first and a second integrated circuit package, wherein each said package has a bottom surface and a top surface, wherein a plurality of package leads extend from each said bottom surface;

(b) providing at least one lead carrier, wherein said lead carrier is comprised of a plurality of electrically and thermally conductive elements, each of said conductive elements is formed having a package lead connection portion adapted to receive one of said package leads and an interconnect portion that provides an external-to-module point of electrical connection to one of said package leads;

(c) mounting said second package to said surface of said first package, wherein said top surface of said second package is orientated in the direction of said first package; and

(d) mounting said lead carrier to the bottom surface of said second package, wherein said package leads of said second package are received by select ones of said package lead connection portions forming a stacked, multiple package module.

26. The method of claim 25 for manufacture of an integrated circuit module wherein each said lead connection portion is formed having an aperture adapted to receive one of said package leads.

27. The method of claim 25, wherein the methods of mounting include the use of adhesive.

28. The method of claim 25, wherein at least one of said interconnect portions includes a substrate mounting portion, and further comprising the steps of:

(a) providing a substrate adapted to receive said substrate mounting portions; and

(b) mounting said stacked multiple package module.

29. A high density, integrated circuit module of the type including a surface mount integrated circuit packages comprising:

a plurality of an integrated circuit packages, wherein each said package has a bottom surface and a top surface and, wherein a plurality of package leads extend from said bottom surface;

a lead carrier comprised of a plurality of electrically and thermally conductive elements, wherein each of said conductive elements is formed having a lead connection portion adapted to receive one of said package leads, and an interconnect portion that provides an external-to-module point of electrical connection to one of said package leads; and

said packages and said lead carrier are aligned and stacked on the other to form a module, wherein two adjacent of said packages flank one of said lead carriers, wherein select ones of said package leads of one of said adjacent packages are received by select ones of said lead connect portions of said lead carrier.

30. The integrated circuit module of claim 29, wherein each said lead connection portion is formed having an aperture adapted to receive one of said package leads.

31. The integrated circuit module of claim 30, wherein each said aperture is formed to have a semi-circular shape.

32. The integrated circuit module of claim 30, wherein each said aperture is formed to include peripheral channels adapted to fill with excess molten solder.

33. The integrated circuit module of claim 29, further comprising a first and second adhesive layer, wherein said first adhesive layer is located between said lead carrier and one of said adjacent packages, and the said second adhesive layer is located between said lead carrier and the other of said adjacent packages.

34. The integrated circuit module of claim 33, wherein said adhesive is thermally conductive.

35. The integrated circuit module of claim 29, further comprising:

a substrate-mounting portion formed integral to the distal end of one said interconnect portion; and

a substrate attached to said substrate-mounting portions.

36. The integrated circuit module of claim 29, further comprised of:

one or more electrically and thermally conductive external structures each having a substrate mounting portion; and

wherein select ones of said external structures are electrically and thermally coupled to select ones of said interconnect portions.

37. The integrated circuit module of claim 29, wherein a first of said lead carriers of said multiple package module is dissimilar to a second of said lead carriers of said multiple package module, wherein one of said interconnect leads of said first lead carrier and the corresponding interconnect portions of said second lead carrier do not electrically connect to corresponding said package leads.

38. The integrated circuit module of claim 30, wherein a select one of said interconnect portions is rendered electrically inactive by opening the electrical signal path in select one of said conductive elements.

39. The integrated circuit module of claim 30, wherein a select one of said interconnect portions is removed.

40. The integrated circuit module of claim 38, wherein said lead carriers provide a unique address for each said package.

41. The integrated circuit module of claim 38, wherein said lead carriers provide a unique data word bit position for each said package.